

Evaluation of factors influencing the groundwater chemistry in a small tropical island of Malaysia.

ABSTRACT

Groundwater chemistry of small tropical islands is influenced by many factors, such as recharge, weathering and seawater intrusion, among others, which interact with each other in a very complex way. In this work, multivariate statistical analysis was used to evaluate the factors controlling the groundwater chemistry of Kapas Island (Malaysia). Principal component analysis (PCA) was applied to 17 hydrochemical parameters from 108 groundwater samples obtained from 18 sampling sites. PCA extracted four PCs, namely seawater intrusion, redox reaction, anthropogenic pollution and weather factors, which collectively were responsible for more than 87% of the total variance of the island's hydrochemistry. The cluster analysis indicated that three factors (weather, redox reaction and seawater intrusion) controlled the hydrochemistry of the area, and the variables were allocated to three groups based on similarity. A Piper diagram classified the island's water types into Ca-HCO₃ water type, Na-HCO₃ water type, Na-SO₄-Cl water type and Na-Cl water type, indicating recharge, mixed, weathering and leached from sewage and seawater intrusion, respectively. This work will provide policy makers and land managers with knowledge of the precise water quality problems affecting the island and can also serve as a guide for hydrochemistry assessments of other islands that share similar characteristics with the island in question.

Keyword: Groundwater; Hydrochemistry; Island; Multivariate statistics; Pollution; Seawater intrusion.